948,614

PATENT SPECIFICATION 948,614

DRAWINGS ATTACHED.

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COMPLETE SPECIFICATION.

Scouring Articles and Methods of Manufacturing Them.

We, COLGATE-PALMOLIVE COMPANY, a Corporation organised and existing under the Laws of the State of Delaware, United States of America, of 300 Park Avenue, New York 22, New York, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement :—

This invention relates to scouring pads or strips and to methods of manufacturing them. The invention provides a scouring article with a thin backing and which retains its scouring power and form during use and can be made efficiently and at high speed.

In accordance with this invention, a flexible scouring article comprises a scouring portion of thin scouring fibres, a thin backing material of shape substantially congruent with the scouring portion, and a detergent-resistant waterproof composition adherent to a surface of the backing material and to parts of the scouring fibres and holding the scouring fibres to the backing material, the waterproof composition being a homogeneous composition of paraffinic material and a resinous copolymer of a lower alkylene and a polar comonomer.

According to another aspect of the invention a method of making a thin flexible scouring article comprises pressing a fibrous scouring material against a hot molten waterproof composition on a backing material to embed scouring material fibres in the waterproof composition, and then cooling the composition and embedded fibres until the composition is solidified and the scouring material is held tightly to the backing material thereby.

Some forms of scouring article embodying the invention and some methods for manufacturing them will now be described by way of example with reference to the accompanying drawing, in which :—

Figure 1 is a schematic side elevation of one form of apparatus for manufacturing the scouring articles of this invention ;

Figure 2 is an elevation of another form of apparatus for making the articles ;

Figure 3 is a fragmentary side elevation of a strip of steel wool pads with handles attached ;

Figure 4 is a side elevation of another form of scouring article ; and

Figure 5 is a fragmentary top plan view of the article of Figure 4, being also similar, on an enlarged scale to a top plan of the article of Figure 3.

Referring to Figure 1, numeral 11 designates a roll of paper 13 of high wet strength and of width less than that of a scouring article to be made. The paper, to be made into handles for the scouring pads, is continuously withdrawn and moved under a heated dispensing storage tank or container 15 through the bottom 17 of which molten waterproof adhesive 19, which is a homogeneous composition of normally solid paraffin, a resin copolymer of ethylene and vinyl acetate and an abietic acid material, is fed intermittently in timed increments so that the handles will have adhesive applied to them where they will be fastened to backing mem-

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bers 21, also of high wet strength paper. Such backing members, in a continuous strip, are unrelled from a roll 23 and the backing and handle papers are fed continuously between pressure rolls 25 and 27, after guide rolls 29 and 31 have directed the handle strip to overlie the backing member. Subsequent to pressing the papers together, the sub-assembly is fed past rolls 33 and 35 and passed under another heated container 37 of the same type of waterproof composition as previously described. Once again the heated and molten adherent composition 19, at a temperature of 90° C. to 140° C., is deposited on the paper, this time on the surface of the backing member adjacent to the scouring fibres to be attached. Although the composition may be deposited discontinuously, it is preferred to place it on the backing member as a thin layer or film covering substantially an entire surface of the backing member. The strip coated with molten adherent composition is next covered with a continuous strip of steel wool 39 from a roll 41 and is pressed between pressure rolls 43 and 45 so that the steel wool fibres are pressed into the molten film of adherent composition and are at least partially covered by such film. Separate cooling rolls may be provided to cause solidification of the composition 19 or as shown, the pressure roll 45 may also perform a cooling function. The continuous strip of scouring articles is next spray coated with detergent 47, and any solvent therein, such as water, may be driven off by heating means 49, after which pads are cut to length or scored by knives 51, if desired. Of course, such cutting or scoring will be timed to divide the pads where the handles are held at the ends thereof to the backing members.

In Figure 2 is shown a roll 53 of high wet strength backing paper 55 already hot melt coated with a solidified thermoplastic adhesive 57. The material is directed by rolls 59 and 61 to overlie a strip of steel wool 63 unrolled from a roll 65. A heating roll 67 melts the adhesive by conducting the heat to it via the steel wool fibres in contact with the roll and a pressure roll 69 presses the fibres into the adhesive. Similarly, other rolls 71 and 73 press the assembly against a cooling roll 75 where the thermoplastic adhesive is solidified. Subsequently, soap may be applied and the pads may be cut to size, if desired, as shown in Figure 1.

Figure 3 shows a pad strip of the type shown in Figure 1, with steel wool 39, a continuous layer of adhesive composition 19, backing paper 21, intermittent patches of adhesive composition 19 and a handle 13. The fingers of a user may be fitted between the handle 13 and the backing 21 by flexing the pad. Although the pad of Figure 3 is most easily manufactured, it is sometimes considered desirable to make a pad with a handle which contains an opening for the fingers that does not require flexing of the pad. Such an article is illustrated in Figure 4. Here are shown steel wool 39, a continuous layer of adhesive composition 19, paper backing 21, patches of adhesive 19 and a handle 77. The handle may be folded at either or both of corners 79 and 81 and may be packed flat for shipping. This handle is also shown in Figure 5.

For simplicity of presentation, the preceding description of the invention has been with respect to some preferred embodiments. It will be evident that other forms of article may be produced and other methods may be applied. Thus, the article need not have a handle thereon and may be in roll, strip, sheet or single article form.

The thin scouring fibres are preferably steel wool, although other usual metal and synthetic plastic wools may also be used. The steel wool is of the usual diameter from about 2 to 30 mils, a mil being a thousandth of an inch. It may be randomly matted but it is preferred that the fibres extend substantially in the same direction. The steel wool portion may be about 1 to 6 millimetres in thickness and sometimes may be ironed to an even thinner layer. Expressed in terms of the " density " employed in the art to describe such wools, they are usually of 0.01 to 0.2 gram per square centimetre.

The backing material can be any suitable sheet substance, but is preferably a cellulosic sheet material, such as paper. The backing should be treated to develop a high wet strength so that it will not be too readily affected by exposure to water. Among the well known treatments employed are depositing on the paper emulsions of synthetic organic plastics of various types, e.g., the amino resins. Acceptable paper backings are those of a thickness of 1 to 10 mils. The backing may be smooth, ribbed or irregular in profile, as desired but will usually be substantially flat. Although other handle materials may be used, usually the handles will be of high strength paper too, and will have approximately the same physical properties as the backing.

The waterproof material adherent to scouring fibres and backing material is a thermoplastic resinous adhesive composition which can be melted to coat a surface or parts of a surface of the backing member and can then be readily solidified by cooling to lock in scouring fibres and hold them to the backing material. The deposit of the waterproof composition is generally about 1 to 10 mils in thickness but greater thicknesses may be used. Usually the composition is applied in the molten state at a temperature of 90° C. to 140° C. and is solidified by cooling to below 50° C. The same adhesive is preferably used

to hold the handle to the backing member, if a paper handle is used.

Of the compositions for holding scouring fibres to paper, those comprising a paraffinic material and a resinous copolymer of a lower alkylene and a polar comonomer have been found to have superior properties, holding the steel wool to the paper despite continuous rubbing on pots when the pad is completely wet and in contact with detergent solution. Of the lower alkylenes, i.e. those of up to five carbon atoms in the molecule, ethylene is much preferred. The polar comonomer may be one which will produce a copolymer with the lower alkylene which will blend readily with the paraffin. Of such may be mentioned vinyl lower fatty acid esters, such as vinyl acetate; vinyl chloride; acrylonitrile; and other derivatives of lower olefinic alcohols, e.g., derivatives of vinyl and allyl alcohols. Of these, the copolymers of lower alkylene with lower fatty acid esters of lower olefinic alcohol, such as vinyl alcohol, are preferred. Although the acetates are preferred, other esters, such as the propionates may be useful too.

The particular copolymers of ethylene and vinyl acetate which are especially desirable are those which have a 5 to 50% content of polymerized vinyl acetate and most preferred are those of 25 to 40% of such content. This type of material can be made by copolymerizing a mixture of ethylene and vinyl acetate in the presence of a suitable catalyst, such as oxygen or organic peroxide, at a pressure of 15,000 to 30,000 pounds per square inch and a temperature of 150° C. to 250° C. Materials of this type are made by E.I. du Pont de Nemours & Co., Inc., Wilmington, Delaware, United States of America, under the trade name "Elvax."

The paraffinic materials employed are preferably normally solid paraffins. They may be amorphous or crystalline, microcrystalline waxes and others usually obtained from petroleum being acceptable. The paraffinic material, mixed with the copolymer, produces a waterproof material of unusually good adhesive properties.

In addition to the paraffin and copolymer, it has been found that abietic acid materials, such as abietic acid, isomers thereof, hydrogenated abietic acid, aromatized abietic acid and esters of abietic acid are useful in conjunction with the other components described above. These materials increase the tackiness of the adhesive and make it hold better to the steel wool before being completely solidified, thereby helping to increase the speed of manufacturing the products. Rosin is a good source of abietic acid, and modified rosins and rosin derivatives may be used.

The proportions of copolymer, paraffinic material and abietic acid should be such as to produce a uniform mixture or solution which forms a good homogeneous adherent melt and does not become excessively fluid on heating. To obtain this result, it is found that one should employ 15 to 60% of copolymer, 20 to 80% paraffin and 5 to 40% abietic acid material. Preferred compositions comprise 30 to 50% of a copolymer of ethylene and polyvinyl acetate, 20 to 40% of paraffin wax and 20 to 40% of abietic acid material, such as a stabilized rosin.

After the steel wool or other scouring fibrous material has been joined to the backing, detergent may be coated on the fibrous material. Usually it will be preferable to employ an organic detergent, such as sodium higher alkyl benzene sulphonate, block copolymer of ethylene and propylene oxides (Pluronic), alkali metal lauryl sulphate, sodium tallow acids amide of N-methyl taurine (Igepon T), sodium soap or potassium soap of higher fatty acids of 12 to 18 carbon atoms, such as are obtained from mixtures of tallow and cocoanut oil. Inorganic detergents, such as pentasodium tripolyphosphate, tetrasodiumpyrophosphate and others, may be employed to supplement or replace the organic detergent but it is preferred to utilize some soap or other synthetic organic detergent too. The detergent may be applied as a melt, which dries to a hard coating without the need for a special evaporation operation. The detergent may also be applied as a solution or dispersion, e.g. an aqueous solution of soap. In such an application the coating of waterproof composition holding the scouring wool to the backing material also prevents absorption of the soap by the backing material and keeps it adjacent to the steel wool, ready to help clean articles being scoured. Usually after application of a solution or dispersion of detergent, it will be desirable to evaporate off excess moisture or solvent, preferably hy heat, forced air drying or a combination of both.

In addition to the components of the article described above, one may employ adjuvants which are known in the detergent art. Thus, perfumes, colouring agents, fluorescent brighteners, bleaches, foam enhancing additives, antibacterial and fungicidal compounds and rust preventing materials may be employed. If stable, such adjuvants may be formulated with the detergent or may be separately added, as desired.

The paper backing and handle may be coloured or printed with indicia or instructions for use.

The articles are effective in use, being especially suitable for cleaning and scouring operations and yet so economical that the used article may be disposed of after being used for scouring a single meal's pots and pans.

The method described lends itself to rapid, large scale automatic production of scouring

pads or strips and so enables the cost of production to be so lowered as to permit sale of the articles for single use application, allowing the housewife to employ a fresh scouring article each time cooking utensils need to be scoured and polished.

The fact that the pad is thin, usually less than 6 millimeters thick, including the folded down handle, contributes to its flexibility. The backing material and the waterproof adherent composition which holds the congruent portion of scouring fibres to it prevent the thin layer of fibres from being torn apart and at the same time the backing material and handle allow the housewife to employ the scouring article without having to contact either the scouring wool or water with the fingers.

The utility of a pad of the type described depends very greatly upon the bond between the backing paper and steel wool. This bond must be detergent and water-resistant, yet it should be of such flexibility that the bonding composition does not flake off excessively in use. The waterproof compositions described satisfy these requirements. Even when the fibres are subjected to pulling forces, as during difficult scouring of pan edges, they do not separate from the backing to an objectionable extent. Neither does the high wet strength paper shred or "ball up" during use. Such improved properties of the article are largely attributable to the efficacy of the waterproof bonding compositions described.

The method of this invention is superior to other methods of making such articles in which conventional adhesives, such as rubber cements, solvent-dissolved cements, emulsions and so forth are used. By applying the bonding composition in molten form, the necessity of using expensive solvent recovery systems for toxic solvents is avoided. Also, drying expense, which is greater than heating and cooling expenses, is avoided. The grip of the bonding composition on the steel wool is effected quickly by the cooling operation and the method can be carried out rapidly so that greatly improved production capacities are obtained. Because no water is present in the hot molten composition there is no rusting of steel wool and it remains attractively bright and shiny in appearance. Furthermore, the simultaneous cooling and pressing of the steel wool into the waterproof composition makes a bond superior to that obtained without either the pressing or cooling operations.

In addition to being adapted to continuous production of steel wool pads, the method makes a strip or roll product which may be preferred in some cases to single pads. The strip or roll of pads, held together by an integral paper backing, may be pre-scored or partially cut to facilitate separation immediately before use.

The following example details a method of making these articles. All parts and proportions in this example and elsewhere in the Specification are by weight, unless otherwise stated.

EXAMPLE I.

Thirty parts paraffin wax with a melting point of approximately 70° C., 30 parts Staybelite resin (a hydrogenated stabilized rosin made by Hercules Powder Co., Wilmington, Delaware, United States of America) and 40 parts of an ethylene-vinyl acetate copolymer in which the ethylene : vinyl acetate ratio was approximately 67 : 33 were blended together and melted at 115° C. The melt was then coated onto the paper substrate by bringing the paper into contact with the molten composition on an applicator. The coating weight was regulated so that, for a creped, wet strength paper of basis weight of 37 pounds per ream, a preferred weight of coating of 45—50 pounds per ream was applied. After coating, the application of steel wool to the coated side of the paper was carried out. This was done by feeding the coated paper and steel wool onto a heated roll. The warm steel wool then embedded itself into the adhesive layer and a subsequent chilling and pressing step at 10° C. set the adhesive. The product was then ready for coating of the steel wool with detergent.

A 33% aqueous solution of a mixture of potassium and sodium soaps was automatically brushed onto the steel wool as the strip was fed under a brush. The soap was a 50 : 50 coco : tallow soap in which the saponifying alkali metal was a 9 : 1 mixture of potassium and sodium. The soap solution was applied at the rate of 0.05 grams per square centimetre of pad, leaving about 0.017 grams of dry soap on the same area. The excess moisture was dried off by forced air at 50° C. Next, the pads were cut to size and packed for distribution.

The articles made were laboratory tested, using practical use procedures, and were found to be capable of removing heavy deposits of burnt foods from pots and pans. They also polished as well as or better than, ordinary commercial scouring pads.

WHAT WE CLAIM IS:—

1. A flexible scouring article comprising a scouring portion of thin scouring fibres, a thin backing material of shape substantially congruent with the scouring portion, and a detergent-resistant waterproof composition adherent to a surface of the backing material and to parts of the scouring fibres holding the scouring fibres to the backing material, the waterproof composition being a homogeneous composition of paraffinic material and a

resinous copolymer of a lower alkylene and a polar comonomer.

2. A scouring article as claimed in Claim 1 in which the backing material is a high wet strength paper.

3. A scouring article as claimed in Claim 1 or Claim 2 in which a thin closed handle is affixed to the backing material at the handle ends.

4. A scouring article as claimed in any of the preceding claims held to another such article by an integral backing.

5. A scouring article as claimed in any of the preceding claims in which the scouring portion and the article are thin, and the waterproof composition comprises a lower fatty acid ester of a lower olefinic alcohol as the polar comonomer thereof and is present as a thin layer covering parts of the scouring fibres.

6. A scouring article as claimed in any of the preceding claims in which the scouring portion is of steel wool scouring fibres, the waterproof composition is a homogeneous composition of normally solid paraffinic material and a resin copolymer of ethylene and vinyl acetate and the waterproof composition covers the steel wool fibres sufficiently to hold them to the paper backing material and covers the paper to seal, stiffen and strengthen it and to prevent shredding of the paper during a scouring operation.

7. A scouring article as claimed in any of the preceding claims in which the backing material and scouring portions are flat, the waterproof composition covers and adheres to substantially an entire surface of the backing material and the waterproof material includes an abietic acid material.

8. A scouring article as claimed in any of the preceding claims in which the scouring fibres are coated with a detergent.

9. A scouring article as claimed in any of the preceding claims in which the waterproof composition comprises 20 to 80% paraffin wax, 5 to 40% of an abietic acid material consisting of abietic acid, an isomer of abietic acid, aromatized abietic acid, an abietic acid ester or hydrogenated abietic acid or a mixture of two or more of such materials, and 15 to 60% of a resin copolymer of ethylene and vinyl acetate with a content of 5 to 50% of polymerized vinyl acetate.

10. A scouring article as claimed in any of the preceding claims, of total thickness less than six millimetres, in which the scouring fibres extend in substantially the same direction and are held in alignment by a hot melt waterproof composition comprising 20 to 40% paraffin wax, 20 to 40% of rosin acids or derivative thereof or a mixture of such materials, and 30 to 50% of a resin copolymer of ethylene and vinyl acetate of a content of polymerized vinyl acetate of 25 to 40%.

11. A method for making a thin flexible scouring article which comprises pressing a fibrous scouring material against a hot molten waterproof composition on a backing material to embed scouring material fibres in the waterproof composition, and then cooling the composition and embedded fibres until the composition is solidified and the scouring material is held tightly to the backing material thereby.

12. A method as claimed in Claim 11 in which the scouring material consists of heat-conductive fibres, and the waterproof composition is a thermoplastic, resinous adhesive which is melted by application of heat to the heat conductive fibres pressing against the adhesive.

13. A method as claimed in Claim 11 or Claim 12 in which there is applied to substantially an entire surface of a continuous strip of high wet strength thin paper backing material, a waterproofing and adhesive thin film of a homogeneous, molten, thermoplastic composition of paraffinic material and resin copolymer of ethylene and vinyl acetate in which polymerized vinyl acetate is 5 to 50% thereof, contacting the film of such composition with a continuous strip of fibrous scouring material, pressing such material against the paper backing and into the film while maintaining the film at a temperature of 90 to 140° C. so as to embed a substantial proportion of the fibres in the film while the film is molten, and then continuously cooling the strip to a temperature less than 50° C. at which temperature the film is hard and the fibres are held tightly to the backing material.

14. A method as claimed in any of Claims 11 to 13 in which, after the fibrous scouring material is held to the backing material, the fibres are first coated with an aqueous solution of organic detergent and moisture is removed therefrom by drying.

15. A method as claimed in any of Claims 11 to 14 in which a continuous strip of paper, smaller than the backing material, is joined to the back thereof at a plurality of positions so located that, on cutting of the strip into individual pads, each will have a handle fastened thereto at both ends thereof.

16. A scouring article substantially as described with reference to Figure 3, or Figures 4 and 5, of the accompanying drawings.

17. A method of making a scouring article substantially as described with reference to Figure 1 or Figure 2 of the accompanying drawings.

18. A method of making a scouring article substantially as described in the foregoing example.

19. A scouring article made by a method as claimed in any of Claims 11 to 15, 17 or 18.

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948614 COMPLETE SPECIFICATION

1 SHEET *This drawing is a reproduction of the Original on a reduced scale*

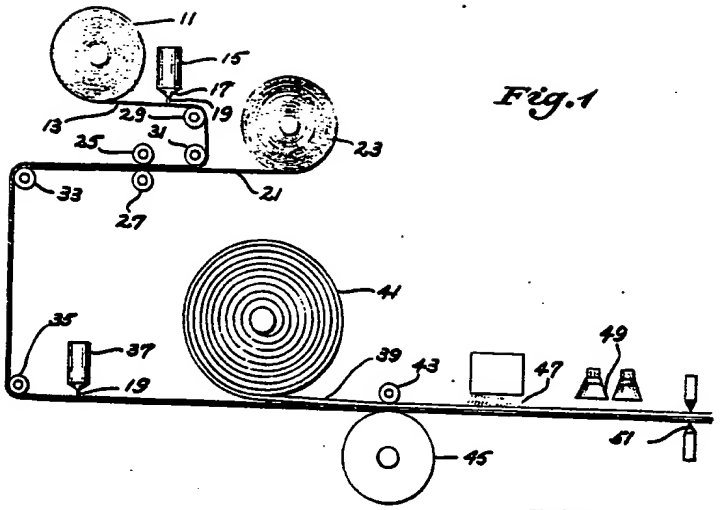

Fig.1

Fig.2

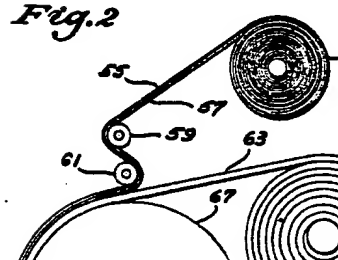

Fig.4

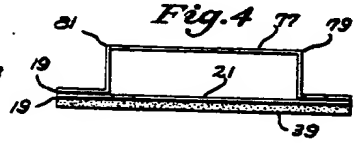

Fig.5

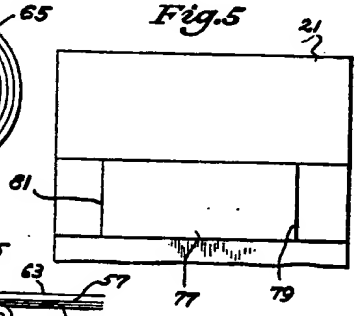

Fig.3